

REMARKS/ARGUMENTS

Examiner D. Nguyen is thanked for the thorough Search and Examination of the Subject Application for Patent.

The Specification has been amended to supply the missing Patent Application serial numbers and file dates, as required by the Examiner.

Claim 1 has been amended to add the limitation that the polymer body has a Young's Modulus of between about 400,000 and 500,000 pounds per square inch. The basis for this amendment to Claim 1 can be found in the second paragraph on page 5 of the Specification.

Claim 3 has been amended to remove the limitation that the conductive metal coating is comprised of an adhesion layer, a barrier layer and a conductor layer and include the limitation that the conductive metal coating comprises chrome, copper, and gold. The basis for this amendment to Claim 3 can be found in the last paragraph on page 8 of the Specification.

Reconsideration of the Objection to the Disclosure is requested. The Specification has been amended to supply the missing Patent Application Serial Numbers and Filing Dates as required by the Examiner.

Reconsideration of the Objection to the Drawings is requested. Claim 3 has been amended to remove the limitation that the conductive metal coating is comprised of an adhesion layer, a barrier layer and a conductor layer. It is believed that with this amendment to Claim 3 the Drawings show every feature of the invention specified in the claims.

Reconsideration of the Rejection of Claims 1-3 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1-3 of U.S. Pat. No. 6,249,051 B1 is requested. Claims 1-3 are significantly different from Claims 1-3 of U.S. Pat. No. 6,249,051 B1 for the following reasons. Claims 1-3 of U.S. Pat. No. 6,249,051 B1 describe a bonded structure, comprising "a plurality of physical and electrical connections between said integrated circuit element input/output pads and said substrate input/output pads wherein each said connection includes a soldering metal and a composite bump comprised of a single polymer body with a conductive metal coating covering said polymer body wherein said physical and electrical connections are formed by said soldering metal." It is a significant limitation of Claims 1-3 of U.S. Pat. No. 6,249,051 B1 that soldering metal is required for the physical and electrical connections. In Claims 1-3 of U.S. Pat. No. 6,249,051 B1 the soldering metal is a key part of the structure. In Claims 1-3 of U.S. Pat. No. 6,249,051 B1 there is no limitation that the polymer body has a Young's Modulus of between about 400,000 and 500,000 pounds per square inch.

Claims 1-3, as amended, of the Subject Patent Application describe a bonded structure, comprising "a plurality of physical and electrical connections between said integrated circuit element input/output pads and said substrate input/output pads wherein each said connection includes a composite bump comprised of a polymer body and a conductive metal coating covering said polymer body, said polymer body has a Young's Modulus of between about 400,000 and 500,000 pounds per square inch, and wherein said composite bump is deformed when said connection is formed." Soldering metal is neither described nor required in the bonded structure of Claims 1-3 of the Subject Patent Application . In the bonded structure of Claims 1-3 of the Subject Patent Application no soldering metal is used. Claims 1-3 of the Subject Patent Application contain the limitation that the polymer body has a Young's Modulus of between about 400,000 and 500,000 pounds per square inch.

It is believed that the bonded structure of Claims 1-3 of the Subject Patent Application having deformed composite bumps, a polymer body having a Young's Modulus of between about 400,000 and 500,000 pounds per square inch, and no soldering metal is patentably distinct from the bonded structure of Claims 1-3 of U.S. Pat. No. 6,249,051 B1 which requires soldering metal and does not require deformed composite bumps. Reconsideration of the Rejection of Claims 1-3 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1-3 of U.S. Pat. No. 6,249,051 B1 is requested.

Reconsideration of the Rejection of Claims 4-5 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1 and 7 of U.S. Pat. No. 5,431,328 is requested. Claims 4-5 are significantly different from Claims 1 and 7 of U.S. Pat. No. 5,431,328 for the following reasons. Claims 1 and 7 of U.S. Pat. No. 5,431,328 describe a method of forming a bonded structure and have the key limitations of "providing a soldering metal; heating said soldering metal to a temperature of about 30° C. above the melting point of said soldering metal; and cooling said soldering metal below the melting point of said soldering metal." Claim 1 has the limitation of "bringing together said composite bumps formed on said integrated circuit element input/output pads, said substrate input/output pads, and said soldering metal". Claim 7 has the limitation of "bringing together said composite bumps formed on said substrate input/output pads, said integrated circuit element input/output pads, and said soldering metal". It is a significant limitation of Claims 1 and 7 of U.S. Pat. No. 5,431,328 that soldering metal is required for the physical and electrical connections. In Claims 1 and 7 of U.S. Pat. No. 5,431,328 the bonded structure requires soldering metal and deformed composite bumps are not required. In Claims 1 and 7 of U.S. Pat. No. 5,431,328 there is no limitation that the polymer body has a Young's Modulus of between about 400,000 and 500,000 pounds per square inch.

Claims 4-5 of the Subject Patent Application describe a bonded structure, comprising "a plurality of physical and electrical connections between said integrated circuit element input/output pads and said substrate input/output pads wherein each said connection includes a composite bump comprised of a polymer body and a conductive

metal coating covering said polymer body, and wherein said composite bump is deformed when said connection is formed." Soldering metal is neither described nor required in the bonded structure of Claims 4-5 of the Subject Patent Application . In Claims 4-5 of the Subject Patent Application the bonded structure has deformed composite bumps and no soldering metal. Claims 4-5 of the Subject Patent Application contain the limitation that the polymer body has a Young's Modulus of between about 400,000 and 500,000 pounds per square inch.

It is believed that forming the bonded structure of Claims 4-5 of the Subject Patent Application without the soldering metal, with a polymer body having a Young's Modulus of between about 400,000 and 500,000 pounds per square inch, and with deformed composite bumps makes Claims 4-5 patentably distinct from Claims 1 and 7 of U.S. Pat. No. 5,431,328 which requires soldering metal, does not require deformed composite bumps, and does not require a polymer body having a Young's Modulus of between about 400,000 and 500,000 pounds per square inch. Reconsideration of the Rejection of Claims 1-3 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1 and 7 of U.S. Pat. No. 5,431,328 is requested.

Reconsideration of the Rejection of Claims 1 and 3-5, as amended, under 35 U.S.C. 103(a) as being unpatentable over Karnezos (U.S. Pat. No. 4,813,129) is requested. Claims 1 and 3-5 describe a bonded structure comprising the key limitations of "a composite bump comprised of a polymer body and a conductive metal coating

covering said polymer body" wherein "said polymer body has a Young's Modulus of between about 400,000 and 500,000 pounds per square inch".

The invention of Karnezos describes an interconnection structure for PC boards and integrated circuits. Karnezos describes a number of buttons for interconnections between one substrate having input/output pads and a second substrate having input/output pads. The buttons described by Karnezos have a resilient core made from an organic material, such as polyimide, and are covered with a metallic coating, see column 4, lines 15-40. Karnezos does not describe a particular Young's Modulus for the resilient core, as is specified in Claims 1 and 3-5. The limitation of the Young's Modulus of between about 400,000 and 500,000 described in Claims 1 and 3-5 insures that when the composite bump is deformed when the connection is formed, as is described in Claims 1 and 3-5, the composite bump will not later change shape and disturb the integrity of the connection. Use of a polymer having a Young's Modulus of between about 400,000 and 500,000 pounds per square inch is neither described nor suggested by Karnezos.

It is believed that the bonded structure of Claims 1 and 3-5 wherein the polymer body of the composite bump has a Young's Modulus of between about 400,000 and 500,000 pounds per square inch is different from and not obvious from Karnezos. Reconsideration of the Rejection of Claims 1 and 3-5, as amended, under 35 U.S.C. 103(a) as being unpatentable over Karnezos, and allowance of Claims 1 and 3-5, are requested.

Reconsideration of the Rejection of Claim 2 under 35 U.S.C. 103(a) as being unpatentable over Karnezos (U.S. Pat. No. 4,813,129) in view of Afzali-Ardakani et al.(U.S. Pat. No. 5,397,863) is requested. Claim 2 describes a bonded structure comprising the key limitations of "a composite bump comprised of a polymer body and a conductive metal coating covering said polymer body" wherein "said polymer body has a Young's Modulus of between about 400,000 and 500,000 pounds per square inch". Claim 2 includes the further limitation that the polymer is polyamic acid polyimide.

The invention of Karnezos describes an interconnection structure for PC boards and integrated circuits. Karnezos describes a number of buttons for interconnections between one substrate having input/output pads and a second substrate having input/output pads. The buttons described by Karnezos have a resilient core made from an organic material, such as polyimide, and are covered with a metallic coating, see column 4, lines 15-40. Karnezos does not describe a particular Young's Modulus for the resilient core, as is specified in Claim 2. The limitation of the Young's Modulus of between about 400,000 and 500,000 pounds per square inch described in Claim 2 insures that when the composite bump is deformed when the connection is formed, as is described in Claim 2, the composite bump will not later change shape and disturb the integrity of the connection. Use of a polymer having a Young's Modulus of between about 400,000 and 500,000 pounds per square inch is neither described nor suggested by Karnezos.

As indicated by the Examiner, Afzali-Ardakani et al. describe a polymer wherein the polymer is polyamic acid polyimide. However, Afzali-Ardakani et al. do not describe nor make obvious the use of a polymer having a Young's Modulus of between about 400,000 and 500,000 pounds per square inch.

It is believed that the bonded structure of Claim 2 wherein the polymer body of the composite bump has a Young's Modulus of between about 400,000 and 500,000 pounds per square inch is different from and not obvious from Karnezos in view of Afzali-Ardakani et al. Reconsideration of the Rejection of Claim 2 under 35 U.S.C. 103(a) as being unpatentable over Karnezos in view of Afzali-Ardakani et al., and allowance of claim 2, are requested.

Reconsideration of the Rejection of Claims 4 and 6 under 35 U.S.C. 103(a) as being unpatentable over Karnezos (U.S. Pat. No. 4,813,129) in view of Schulte et al. (U.S. Pat. No. 4,865,245) is requested. Claims 4 and 6 describes a bonded structure comprising the key limitations of "a composite bump comprised of a polymer body and a conductive metal coating covering said polymer body" wherein "said polymer body has a Young's Modulus of between about 400,000 and 500,000 pounds per square inch". Claim 4 includes the further limitation that "said composite bumps are formed on said integrated circuit element input/output pads prior to formation of said connection." Claim 6 adds the further limitation that "said composite bumps are formed on both said integrated circuit element input/output pads and substrate input/output pads prior to formation of said connection."

The invention of Karnezos describes an interconnection structure for PC boards and integrated circuits. Karnezos describes a number of buttons for interconnections between one substrate having input/output pads and a second substrate having input/output pads. The buttons described by Karnezos have a resilient core made from an organic material, such as polyimide, and are covered with a metallic coating, see column 4, lines 15-40. Karnezos does not describe a particular Young's Modulus for the resilient core, as is specified in Claims 4 and 6. The limitation of the Young's Modulus of between about 400,000 and 500,000 pounds per square inch described in Claims 4 and 6 insures that when the composite bump is deformed when the connection is formed, as is described in Claims 4 and 6, the composite bump will not later change shape and disturb the integrity of the connection. Use of a polymer having a Young's Modulus of between about 400,000 and 500,000 pounds per square inch is neither described nor suggested by Karnezos.

As indicated by the Examiner, Schulte et al. describe the formation of contact bumps on integrated circuit element input/output pads prior to formation of a connection and on both integrated circuit element input/output pads and substrate input/output pads prior to formation of a connection. However, Schulte et al. do not describe nor make obvious the use of a polymer having a Young's Modulus of between about 400,000 and 500,000 pounds per square inch.

It is believed that the bonded structure of Claims 4 and 6 wherein the polymer body of the composite bump has a Young's Modulus of between about 400,000 and 500,000 pounds per square inch is different from and not obvious from Karnezos in view of Schulte et al. Reconsideration of the Rejection of Claims 4 and 6 under 35 U.S.C. 103(a) as being unpatentable over Karnezos in view of Schulte et al., and allowance of claims 4 and 6, are requested.

It is believed that Claims 1-6 differ patentably from the references. Allowance of the Claims 1-6 is requested.

It is requested that should Examiner Nguyen not find that the Claims are now Allowable that the Examiner call the undersigned Agent at (845)-462-5363 to overcome any problems preventing allowance.

Respectfully submitted,

A handwritten signature in cursive script, reading "Larry J. Prescott". The signature is written in dark ink and is positioned above the printed name.

Larry J. Prescott, Reg. No. 39,335